

Topical Applications Of Sodium Fluoride And Stannous Fluoride

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SODIUM FLUORIDE applied topically to the teeth gives approximately 40 percent reduction in the incidence of dental caries in children (1-3). Other fluoride compounds may be even more effective. Laboratory studies suggest that stannous fluoride is superior to sodium fluoride in reducing the solubility of powdered dental enamel (4-6) and whole tooth sections in weak organic acids (7), and experimental studies in hamsters (8) and rats (9-11) have corroborated these findings. Also, there are reports of approximately 60 percent reduction in dental caries in children when stannous preparations were used (12-14).

The present study has tested further the effectiveness as dental caries preventives of 2 percent stannous fluoride and 2 percent sodium fluoride. Nearly 600 children 9-14 years old in Milwaukie and Oregon City, Oreg., participated in all phases of the 16-month study. The children were divided into two comparable groups, one group receiving stannous fluoride and the other sodium fluoride.

Materials and Methods

In Milwaukie and Oregon City, Oreg., a questionnaire was sent to the parents of all children in grades 4 through 9. The questionnaire was used to obtain parental permission for the children to take part in the study and to identify children who had had previous exposure to fluoride. The parents of 69 percent of the children in the 5 grades requested that their children participate in the study. All these children were included except those whose questionnaires indicated that they had previously received topical fluoride applications or had lived at some time in an area having more

than 0.3 ppm of fluoride ion in the water supply. The fluoride content of the public water supply in Milwaukie was 0.25 ppm; in Oregon City, it was 0.20 ppm.

The names of 690 children who were to participate were listed alphabetically by age and sex. Every other child was assigned to one treatment group and the remainder to a second treatment group. In alternate children within each of these groups, the right quadrants received the treatment, and in the remainder, the left quadrants. No selection was made on the basis of caries susceptibility.

A dental prophylaxis was given prior to the initial examination. All examinations were made in December 1955 by the authors, with No. 4 plane mouth mirrors and No. 23 single-end explorers under artificial light. Portable dental chairs were used. Compressed air was applied routinely to each quadrant during examination.

Both fluoride solutions were applied four times by the same dental hygienist, using the method described by Knutson (15). The treatments were begun in January 1956 and completed within 4 months. One group of children received a 2 percent aqueous, unbuffered sodium fluoride solution. The other group received a 2 percent aqueous, unbuffered stannous fluoride solution. In all children, the solution being tested was applied to one side of the mouth, and distilled water to the other side. Celluloid strips were used between the central incisors, both upper and lower, to help prevent the fluoride solution from contacting the untreated side. The sodium fluoride solution was prepared daily. The stannous fluoride solution was prepared hourly with oxygen-free distilled water, since it deteriorates rapidly (16, 17).

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Table 1. Age distribution of 588 children available for reexamination at the end of a 16-month period, Milwaukie and Oregon City, Oreg.

Fluoride solution ¹	Number of children by age (last birthday) at time of first examination						
	9	10	11	12	13	14	All ages
Stannous fluoride--	29	19	21	71	66	84	290
Sodium fluoride----	35	23	18	58	76	88	298
Total-----	64	42	39	129	142	172	588

¹ All children received four applications.

Of 671 children treated in the study, 588 were available for reexamination in April 1957, 16 months after the first examination. Of these 298 were treated with sodium fluoride and 290 with stannous fluoride. Each of the dentists examined the same children he had examined originally. Equipment and procedures used for the reexamination were identical with those of the first examination. New record cards were prepared so that the examiner would not know the results of his first examination nor which solution had been used. A prophylaxis was given before the second examination to remove any stains that might have developed from the application of stannous fluoride.

In this discussion, analysis of the data on caries experience is confined to the erupted per-

manent teeth seen at the time of the initial examination. The age classification refers to the age (last birthday) at the time of the first examination (table 1).

Results

The caries experience of the 588 children available for the second examination is shown in table 2, and the percentage reduction in the incidence of newly carious teeth and of carious surfaces in previously carious teeth is given in table 3.

Of 1,087 upper permanent noncarious teeth treated with stannous fluoride, 131, or 12 percent, became carious. In the untreated quadrants, 244 of 1,084 teeth, or 23 percent, became carious. The proportion of teeth that became carious is significantly lower among the treated than among the untreated teeth.

Of the 1,103 upper permanent noncarious teeth that were treated with sodium fluoride, 171, or 16 percent, became carious. Again, the proportion of treated teeth that became carious is significantly lower among the treated than among the untreated teeth.

There were more noncarious permanent teeth in the lower arch of the 588 children than in the upper arch, and a smaller percentage of the teeth in this arch became carious whether treated or not. However, in the lower arch as in the upper one, the proportion of newly carious teeth is significantly lower among the treated

Table 2. Dental caries experience during a 16-month period in permanent teeth of fluoride-treated and untreated mouth quadrants of 588 children, Milwaukie and Oregon City, Oreg.

Treatment groups, by treated and untreated quadrants	Number of noncarious teeth, December 1955	Newly carious teeth, April 1957		Caries surfaces in newly carious teeth	Newly carious surfaces in previously carious teeth	Total newly carious surfaces
		Number	Percent			
Stannous fluoride:						
Treated upper quadrant-----	1, 087	131	12	175	221	396
Untreated upper quadrant-----	1, 084	244	23	320	243	563
Treated lower quadrant-----	1, 261	88	7	119	186	305
Untreated lower quadrant-----	1, 247	150	12	214	211	425
Sodium fluoride:						
Treated upper quadrant-----	1, 103	171	16	237	192	429
Untreated upper quadrant-----	1, 105	257	23	343	203	546
Treated lower quadrant-----	1, 317	79	6	112	164	276
Untreated lower quadrant-----	1, 312	133	10	171	194	365

Table 3. Percentage fewer newly carious teeth and tooth surfaces during a 16-month period in permanent teeth of fluoride-treated mouth quadrants of 588 children, Milwaukie and Oregon City, Oreg.

Fluoride solution	Percentage fewer newly carious teeth			Percentage fewer newly carious surfaces of previously carious teeth		
	Upper arch	Lower arch	Both arches	Upper arch	Lower arch	Both arches
Stannous fluoride.....	46.3	41.3	44.4	9.1	11.8	10.4
Sodium fluoride.....	33.5	40.6	35.9	5.4	15.5	10.3

than among the untreated teeth regardless of the fluoride solution used.

In the upper arch, a smaller proportion of caries-free permanent teeth became carious after treatment with stannous fluoride than after treatment with sodium fluoride. This difference is statistically significant. In the lower arch, the proportion of caries found in teeth treated with stannous fluoride is not significantly different from the proportion in those treated with sodium fluoride. Neither is there a significant difference in caries incidence between the two types of treatment when the data for both arches are combined.

The reduction in the incidence of dental caries on tooth surfaces of previously carious teeth was not significant for either the sodium or stannous fluoride solutions.

As long as 4 months elapsed between the initial examination and the beginning of treatment of some children. If each child had received treatment immediately following examination, the demonstrated effectiveness of the fluoride solutions might have been greater than that observed in this study.

Summary

Two groups of school children 9-14 years of age were given topical applications of stannous fluoride and sodium fluoride to test the effectiveness of these preparations as dental caries preventives. One group was treated with a 2 percent stannous fluoride solution and the other with a 2 percent sodium fluoride solution. The upper and lower quadrants on one side of the mouth were treated, and the quadrants on the other side served as controls.

Analysis of data on 588 children reexamined 16 months after the initial examination indicated that:

1. The incidence of dental caries in permanent noncarious teeth was significantly lower in mouth quadrants treated with either stannous fluoride or sodium fluoride than in untreated quadrants.

2. The findings relative to the comparative effectiveness of stannous fluoride and sodium fluoride were inconclusive.

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Institute of Perinatal Casualties

An institute on perinatal casualties will be held jointly on December 8-12, 1958, by the University of Michigan School of Public Health and the University of Minnesota School of Public Health in Minneapolis, Minn. Michigan and Minnesota State maternal and child health and crippled children's agencies are also sponsors.

The institute will consist of a series of seminars and discussions on such aspects of perinatal casualties as definition, extent and significance; etiology; prevention; growth and development; coordination of services; mortality studies; care of the premature infant; specialized programs, such as mental retarda-

tion, cerebral palsy, and congenital heart disease; and program planning and evaluation.

Each State in Regions V and VI may select at least four staff members (two each from MCH and crippled children's programs) to attend the institute. Travel expenses, tuition, lodging, and meals of each person selected will be financed by the U. S. Children's Bureau.

For further information Region V applicants should contact Dr. Donald C. Smith, University of Michigan School of Public Health, Ann Arbor, Mich., and Region VI applicants should contact Dr. Helen M. Wallace, University of Minnesota School of Public Health, Minneapolis, Minn.